Results: The cartilage tissue in the human TMJ was clearly visible and distinguishable from bone after contrast enhancement with Optiray (Fig. 1a, 1b). Furthermore, three-dimensional bone reconstructions enabled quantitative analysis and detection of bone abnormalities (Fig. 1c). Easy discrimination between cartilage and SCB allowed for separate visualization in 3D reconstruction and for measures on cartilage thickness (Fig. 1b, 1d). The average cartilage thickness was 0.33±0.04 mm (range: 0.28–0.36 mm) and 0.32±0.22 mm (range: 0.07–0.695 mm) for the baseline and OA-classified samples, respectively.

Conclusions: The present study provides new information about the application of Optiray as a tool to visualize both bone and cartilage tissue in TMJ reconstructions obtained with a CT system. This combined method makes quantitative measures of both articular cartilage and the underlying bone possible at high resolution. To our knowledge, this is the first time simultaneous assessment of bone and cartilage components has been performed in the human TMJ. With the presented methodology, a direct relationship between OA-like features in bone and cartilage can be established. Furthermore, this method can be used for the development of large scale finite element models for the examination of the biomechanical interaction between articular cartilage and SCB in both a healthy and OA situation.

387 PERIPATELLAR SYNOVITIS IN OSTEOARTHRITIS: COMPARISON OF NON-ENHANCED AND ENHANCED MAGNETIC RESONANCE IMAGING (MRI) AND ITS ASSOCIATION WITH PERIPATELLAR KNEE PAIN. THE MOST STUDY

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Purpose: Semiquantitative (SQ) assessment of synovitis in osteoarthritis (OA) studies is usually performed on non-enhanced contrast enhanced proton density weighted fat suppressed (PDFS) or T2 weighted MRI sequences using signal changes in Hoffa’s fat pad (HFP) as a surrogate for synovial thickening. It is not known if these signal changes in Hoffa’s fat pad correlate well with true synovial thickening in the peripatellar region as seen on contrast enhanced T1w MRI. The aims of this study were (1) to evaluate the diagnostic performance of signal changes in HFP assessed on non-enhanced MRI using synovial thickness assessed on contrast enhanced MRI as the reference standard and (2) to assess the association of signal changes in HFP and peripatellar synovial thickness with pain in walking up or down stairs.

Methods: The Multicenter Osteoarthritis (MOST) Study is a NIH-funded longitudinal observational study of individuals who have or are at high risk for knee OA. All subjects with available non-enhanced contrast-enhanced MRI at the 30-month follow-up visit were included. MRI readings were performed by two experienced musculoskeletal radiologists (FWR, AG). Signal changes in HFP were semiquantitatively scored from 0 to 3 in the infrapatellar and intercondylar subregions on non-contrast enhanced PDFS sequences. Peripatellar synovial thickness was scored on contrast enhanced T1w sequences in five subregions (infrapatellar, intercondylar, suprapatellar, medial and lateral parapatellar regions) as grade 0 – normal (<2 mm), grade 1 (2–4 mm), and grade 2 (4–mm). Sensitivity, specificity and accuracy of HFP signal changes were calculated considering the synovial thickness measurements in the infrapatellar and intercondylar subregions on contrast-enhanced MRI as the reference standard. We further evaluated the association between HFP signal changes and synovial thickness (only maximum scores of all subregions evaluated were considered for the analysis) with pain in walking up or down stairs using logistic regression (WOMAC score dichotomized into pain climbing stairs). Adjusted OR* (95% confidence intervals)

Table 1: Association between signal changes in HFP and synovial thickness with peripatellar knee pain

<table>
<thead>
<tr>
<th>Grade</th>
<th>Number of knees (%) with pain climbing stairs</th>
<th>Adjusted OR*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade 0</td>
<td>78/193 (40%)</td>
<td>1.0 (reference)</td>
</tr>
<tr>
<td>Grade 1</td>
<td>60/118 (55%)</td>
<td>1.4 (0.8; 2.3)</td>
</tr>
<tr>
<td>Grade 2</td>
<td>63/82 (79%)</td>
<td>4.1 (2.7; 9.0)</td>
</tr>
</tbody>
</table>

Signal changes on non-contrast enhanced MRI in HFP

Grade 0 | 41/81 (51%) | 1.0 (reference) |
Grade 1 | 65/154 (42%) | 0.6 (0.3; 1.0) |
Grade 2 | 66/109 (61%) | 1.3 (0.7; 2.5) |
Grade 3 | 36/49 (74%) | 2.5 (1.1; 5.7) |

Synovial thickness on contrast enhanced MRI

Grade 0 | 41/81 (51%) | 1.0 (reference) |
Grade 1 | 66/109 (61%) | 1.3 (0.7; 2.5) |
Grade 2 | 66/109 (61%) | 1.3 (0.7; 2.5) |
Grade 3 | 36/49 (74%) | 2.5 (1.1; 5.7) |

Conclusions: The data, shown in Table 1, indicate that contrast enhanced MRI identifies as and discriminates better than non-contrast enhanced MRI. Squared assessment of synovitis should ideally be performed on contrast enhanced MRI.

388 EFFECT OF SUB OPTIMAL SUBJECT POSITIONING AND X-RAY BEAM ALIGNMENT ON THE MEASUREMENT OF RADIOGRAPHIC JOINT SPACE WIDTH: ANALYSIS OF LONGITUDINAL DATA FROM THE OSTEOARTHRITIS INITIATIVE (OAI)

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Purpose: To study the effect of inconsistent knee flexion and beam angle alignment on the measurement radiographic joint space width (JSW) for longitudinal assessment of knee OA.

Methods: Baseline and Year 1 knee radiographs of 160 subjects from the Progression subcohort of the Osteoarthritis Initiative (OAI) were analyzed using a software technique that measured the radiographic joint space width (JSW). The data were a subset of OAI Image Releases 0.1.1, 0.B.1, and 1.B.1. Bilateral knee radiographs were acquired using a fixed flexion protocol designed to maintain consistent knee flexion and beam angle for all visits.

Measurements of medial compartment minimum JSW (mJSW) and JSW at fixed locations were made by a semi-automated software tool that delineated the femoral and tibial margins of the joint. Measurements of JSW were defined as the distance from the tibial margin to the femur margin at fixed locations on the coordinate system shown in Figure 1. In a previous study it was determined that the most longitudinally responsive location for measuring JSW was at x = 0.25. To assess changes in tibial plateau angle between baseline and follow-up, we calculated the distance between the tibial rim and tibial plateau on the digitized image at the location x = 0.25 according to the coordinate system at both visits. Ball bearings placed on the frame, allowed for the measurement of the x-ray beam angle at the joint line at each visit, and the change in angle between visits. We used a software method to measure the change in beam angle between baseline and follow-up for 115 subjects. For the remainder of the knees, our automated method was not able to determine the beam angle at one or both visits, due to software failures and poor quality images.

Using linear regression, we tested the hypotheses that there were associations between change in JSW between baseline and follow-up and the change in angle between visits. We used a software method to measure the change in beam angle between baseline and follow-up for 115 subjects. For the remainder of the knees, our automated method was not able to determine the beam angle at one or both visits, due to software failures and poor quality images.

Results: Figure 2 is a graph of the baseline to follow-up change in JSW versus the absolute value of the change in tibia rim distance. Figure 3 is a graph of the baseline to follow-up change in JSW versus the absolute value of the change in x-ray beam angle. Linear regression (Table 1) showed that there was no association between either change in tibial rim alignment or change in beam angle and the change in JSW.

Conclusions: We found that increases in the measured JSW from baseline to a one year follow-up did not appear to be due to inconsistent subject positioning or x-ray beam angle. The results imply that post acquisition correction for subjects with inconsistent flexion and beam angle may not improve the JSW accuracy. The data also suggest JSW...
measurements, using the fixed flexion technique and the positioning frame, are robust to changes in subject positioning and beam angle.

Table 1

<table>
<thead>
<tr>
<th>R</th>
<th>Significance</th>
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<tbody>
<tr>
<td>Change in mJSW vs rim alignment</td>
<td>0.053</td>
</tr>
<tr>
<td>Change in JSW (x=0.25) vs rim alignment</td>
<td>0.053</td>
</tr>
<tr>
<td>Change in mJSW vs beam angle</td>
<td>0.003</td>
</tr>
<tr>
<td>Change in JSW (x=0.25) vs beam angle</td>
<td>0.075</td>
</tr>
</tbody>
</table>

Figure 1.